IS 5885 (1977): Copper for commutator bars [MTD 8: Copper and Copper Alloys]

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IS : 5885 - 1977
(Reaffirmed 2006)

Indian Standard

SPECIFICATION FOR COPPER COMMUTATOR BAR

(First Revision)

First Reprint SEPTEMBER 1988

UDC 669.3—422.2:621.3.047.24

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 2

July 1977

Indian Standard

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Indian Standard

SPECIFICATION FOR COPPER COMMUTATOR BAR

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 7 January 1977, after the draft finalized by the Copper and Copper Alloys Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 This standard was earlier published in 1970. Copper and silver-bearing copper which were specified in IS : 4519-1968* and IS : 5885-1970†, have now been included in this revision. Copper-cadmium alloy specified earlier has been deleted and instead three types of silver-bearing copper have been specified for different applications. Since all requirements except dimensions are now covered in this revision, IS : 4519-1968* has also been simultaneously revised to retain dimensional requirements only.

0.3 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960‡. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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1. SCOPE

1.1 This standard specifies requirements for copper commutator bars, except their dimensions.

2. SUPPLY OF MATERIAL

2.1 General requirements relating to the supply of material shall conform to IS : 1387-1967§.

*Specification for copper for commutator bars.
†Specification for special copper alloys for commutator bars.
‡Rules for rounding off numerical values (*revised*).
§General requirements for the supply of metallurgical materials (*first revision*).

2.2 The bars may be supplied either in random lengths, in exact specified multiple lengths for subsequent cutting or as plain or shaped segments of specified length for assembly. The surface at the thick or thin edge may be flat or radiused, as required by the purchaser.

2.3 Condition — The material shall be supplied in hard-drawn condition in accordance with mechanical properties laid down in this standard.

3. FREEDOM FROM DEFECTS

3.1 The bars shall be reasonably clean, smooth and free from harmful defects, such as splits, overlapping and cracks.

4. CHEMICAL COMPOSITION

4.1 The material shall be ETP or FRHC copper or silver-bearing coppers, the latter having the following percentages of silver content (silver being counted as copper):

Silver	*Use*
0·03 *Min*	For automobile and slow speed moulded commutators
0·04 *Min*	For industrial and high speed moulded commutators
0·06 *Min*	For traction and large commutators

4.1.1 The chemical composition of ETP or FRHC copper shall be determined in accordance with IS : 440-1964* and shall conform to IS : 191-1967†. The method for determination of silver in silver-bearing coppers shall be as agreed to between the purchaser and the manufacturer, till such time that an Indian Standard on this subject is published.

5. DIMENSIONAL TOLERANCES

5.1 The bars shall be supplied to the ordered dimensions subject to the tolerances as specified in IS : 4519-1977‡.

6. PHYSICAL PROPERTIES

6.1 Hardness — The hardness test shall be made on test pieces taken from the samples (*see* **7**) and shall be carried out in accordance with IS : 2866-1965§ using a load of 10 kgf. The test shall consist of three determinations made within a central longitudinal band 6 mm wide on a side-face upon each of the pieces of material selected for testing. The

*Methods of chemical analysis of copper (*revised*).
†Specification for copper (*second revision*).
‡Dimensions for copper commutator bar (*first revision*).
§Method for Vickers hardness test for copper and copper alloys.

average of all determinations shall be regarded as the Vickers hardness (HV) of the material. The values obtained shall comply with the appropriate requirements of Table 1.

TABLE 1 PHYSICAL PROPERTIES

(*Clause* 6.1)

Thickness at Position 1 (*See* Fig. 4 of IS : 4519-1977*)		Vickers Hardness *HV, Min*	Tensile Strength *Min* N/mm² (kgf/mm²)
Over mm	Up to and Including mm		
—	5	95	310 (31·5)
5	10	90	280 (28·5)
10	—	85	255 (26·0)

*Dimensions for copper commutator bar (*first revision*).

6.2 Tensile Strength — Wherever practicable, tensile tests shall be made on the full section of the material. Alternatively, a test piece having parallel edges cut from the thicker edge of the bar shall be used. Tests shall be made in accordance with IS : 2654-1964*. The bars shall have the tensile properties as given in Table 1.

6.3 Electrical Resistivity — When tested in accordance with IS : 3635-1966† the electrical resistivity measured directly on the test sample shall be not more than 0·017 777 ohm mm²/m at 20°C (equivalent to 97 percent IACS).

7. SELECTION OF TEST SAMPLES

7.1 Mechanical Tests — When the bars are ordered in random or specified multiple lengths, portion of a bar or bars may be selected for testing such that the length selected does not exceed one percent of the total length ordered, provided that a sufficient quantity for one series of tests is taken. Bars which are shortened or divided by taking of test samples shall be accepted as good delivery.

7.1.1 In the case of bars ordered to specified length for assembly, one bar shall be selected per 1 000 bars or per 200 kg whichever is smaller in mass. For orders of less amount, one bar shall be chosen. When the length of bars as ordered is insufficient to provide a satisfactory test piece, the material shall be tested before cutting into lengths.

7.2 Electrical Resistivity Test — The selection of test samples shall be agreed to between the supplier and the purchaser.

*Method for tensile testing of copper and copper alloys.

†Methods of test for resistance of metallic electrical resistance material.

8. RETESTS

8.1 Should any of the test samples first selected by the purchaser fail to pass the tests, mentioned in **6**, two further samples from the same batch shall be selected for testing, one of which shall be from the bar from which original test sample was taken unless that bar has been withdrawn by the supplier.

8.1.1 Should the test pieces from both these additional samples pass, the batch represented by the test samples shall be deemed to comply with this standard. Should the test pieces from either of these additional samples fail, the batch represented by the test samples shall be rejected.

9. MARKING

9.1 Suitable tags and labels with markings made on them to indicate the grade, name of the manufacturer, and any such information required by the purchaser, shall be attached to each bundle of the bars.

9.1.1 The bundles of bars may also be marked with the Standard Mark.

NOTE — The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

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BUREAU OF INDIAN STANDARDS

Headquarters :

Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002

Telephones : 3 31 01 31, 3 31 13 75 Telegrams : Manaksanstha
(Common to all Offices)

Regional Offices :	*Telephone*
*Western : Manakalaya, E9 MIDC, Marol, Andheri (East) BOMBAY 400093	6 32 92 95
†Eastern : 1/14 C. I. T. Scheme VII M, V. I. P. Road, Maniktola, CALCUTTA 700054	36 24 99
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Plot No. 82/83, Lewis Road, BHUBANESHWAR 751002	5 36 27
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5-8-56C L. N. Gupta Marg, (Nampally Station Road), HYDERABAD 500001	22 10 83
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Hantex Bldg (2nd Floor), Rly Station Road, TRIVANDRUM 695001	52 27
Inspection Office (With Sale Point):	
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*Sales Office in Bombay is at Novelty Chambers, Grant Road, Bombay 400007 89 65 28

†Sales Office in Calcutta is at 5 Chowringhee Approach, P. O. Princep Street, Calcutta 700072 27 68 00

Reprography Unit, BIS, New Delhi, India